SEMESTER END EXAMINATION MAY-2024

Course Name:- B.Tech **Semester:- IV**

Paper Name:- Electrical Engineering Materials **Paper Code:- TEE 404**

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. Max Marks-70

समय– 3 घण्टे + 20 मिनट प्रति घटे अतिरिक्त–दृष्टिबाधित एव सह लेखक परीक्षार्थियों के लिए। अधिकतम अंक–70

Instructions:

- The question paper consists of three sections namely A, B, C. All sections are compulsory.
- Section A- Each question carries 3 marks. All questions are compulsory.
- Section B- Answer any 5 out of 7 given questions in maximum one hundred fifty (150) words. Each question carries 7 marks.
- Section C- Answer any 2 out of 3 given questions in maximum three hundred (300) words. Each question carries 10 marks.

निर्देश:

- प्रश्न पत्र में तीन खण्ड अ, ब, व स हैं। सभी खण्ड अनिवार्य हैं।
- खण्ड–अ में प्रत्येक प्रश्न तीन अंक का है। सभी प्रश्न अनिवार्य हैं।
- खण्ड–ब में सात प्रश्नों में से किन्हीं पाँच प्रश्नों के उत्तर अधिकतम 150 शब्दों मे दें। प्रत्येक प्रश्न सात अंक का है।
- खण्ड–स में तीन प्रश्नों में से किन्हीं दो प्रश्नों के उत्तर अधिकतम 300 शब्दों मे दें। प्रत्येक प्रश्न दस अंक का है।

Section - A (खण्ड–अ)

Objective Questions (वस्तुनिष्ठ प्रश्न)

1. Answer all the following questions. 5×3 =15
निम्नलिखित सभी प्रश्न अनिवार्य हैं।

i) What is the coordination number of a simple cubic structure?
   a) 6
   b) 8
   c) 10
   d) 12

ii) The miller indices of the plane, whose intercepts along the axes are (a, 2b, 3c) is:
   a) (3,2,1)
   b) (6,3,2)
   c) (3,6,2)
   d) (2,3,6)

iii) Which of the following theories cannot be explained by classical theory?
   a) Electron theory
   b) Ohm's law
   c) Photo-electric effect
   d) Optical properties of metal

iv) What makes up the total current in a semi-conductor?
   a) Only diffusion current
   b) Only drift current
   c) Drift + diffusion current
   d) Drift + diffusion + biasing current

v) The magnetization is defined by the ratio of
   a) Magnetic moment to area
   b) Magnetic moment to volume
   c) Magnetic flux density to area
   d) Magnetic flux density to volume

Section – B (खण्ड–ब)
Short Answer Questions (लघुउत्तरीय प्रश्न)

2. Answer any five of the following questions in maximum 150 words. **5×7=35**
निम्नलिखित में से किन्हीं पाँच प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें।

i) Explain the formation of energy bands in solid and also classifying the materials using energy bands.

ii) Prove that c/a ratio for an ideal HCP structure is 1.633. Also, calculate the atomic packing fraction of HCP Structure.

iii) Explain heat development in current carrying conductor and also proof, $W = \sigma E^2$ in (per m^3 per sec).

iv) Explain the Seebeck effect and Thomson effect with proper diagram and examples.

v) What is Hall Effect? Derive an expression for Hall voltage and Hall coefficient for metal. Also, write the application of Hall Effect.

vi) Explain in detail the diamagnetism, ferromagnetism, antiferromagnetism and ferrimagnetism with some examples.

vii) What are the permanent magnetic materials? Write down the difference between soft and hard magnetic materials in details with proper examples.

Section – C (खण्ड–स)
Descriptive Questions (विवरणात्मक प्रश्न)

3. Answer any two of the following question in maximum 300 words. **2×10=20**
निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर अधिकतम 300 शब्दों में दें।

i) The potential energy of a system of two atoms is given by $U = -\frac{A}{r^2} + \frac{B}{r^{10}}$. A stable molecule is formed with release of 8.0 eV of energy when the interatomic distance is 2.8 Å. Calculate A and B.

ii) What is Superconductivity? Explain the DC and AC Josephson effect?

iii) What are JFET and IGFET? Explain the working of n-channel JFET and IGFET with proper diagram and symbols. Also draw the output characteristics for n-channel JFET and IGFET.

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